Illinois Tool IV

PATENT SPECIFICATION

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(19)

(54) MASONRY ANCHOR DEVICES

(71) We, ILLINOIS TOOL WORKS INC., a corporation organized under the laws of the State of Delaware, United States of America, of 8501 West Higgins Road, Chicago, Illinois 60631, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:—

In the attachment of panels, supports, channels or other workpieces to a masonry-like structure, it is commonplace to utilize a stud anchor which incorporates a wedging mechanism. Such devices frequently require a manipulation of the wedge to properly set the device within the bore and will also require a secondary fastener member, such as a nut, to be placed over the workpiece and tightened on the stud. Removability when desired, is a major problem when using the prior art devices.

It is a primary object of the invention to provide an anchor device which can be readily inserted, in a bore formed in a masonry structure, by a rotary motion, thus allowing conventional threaded fastener driving tools to be used.

Another object of the invention is to provide a rotary fastener type anchor device which can be inserted and embedded in a masonry-like structure with a minimal amount of torque.

Yet another object of ths invention is to provide a one-piece masonry anchor which can be inserted through a workpiece into and anchored in the masonry structure in a single operational step.

The features of the present invention are defined in the claims.

The anchor devices of the present invention eliminate many of the deficiencies of prior art devices and provide a simple, one-piece, easily installed fastener which will not require a secondary operation to secure a workpiece to a support structure of masonry.

An advantage of the anchor devices of the present invention is that they provide for firm embedding of a helical thread without appreciably disturbing the wall structure of the bore adjacent the embedding.

A further advantage of the anchor devices of the present invention is the ability to utilize dust and aggregate particles removed during embedding to further enhance the pull-out strength of the anchor device.

The accompanying drawings show two examples of anchor devices embodying the present invention. In these drawings:—

Figure 1 is a diagrammatic side elevation of one anchor device;

Figure 2 is an enlarged partial side elevation of this device;

Figure 3 is a partial sectional view showing the anchor device embedded in a masonry-like structure;

Figure 4 is a cross-section taken along the line 4-4 of Figure 2; and

Figure 5 is a partial side elevation showing a modified form of anchor device.

The anchor device 10 shown in Figures 1 to 4 includes an enlarged head 12 with appropriate rotation inducing surfaces 14, and an elongated shank 16 with a substantially pointed entering extremity 18. A sharp-crested helical thread 20 is formed along the length of the shank, providing a first plurality of convolutions, and a helical protuberance 22 is formed along the length of the shank, spaced between adjacent convolutions of the thread 20 and providing a second plurality of convolutions. The thread 20 and helical protuberance 22 have substantially the same pitch. The crest of the protuberance 22 is at a uniform radial distance from the axis of the shank.

A plurality of notches 26 are formed in the crest of the helical thread 20. These notches lie along lines which extend from the entering extremity of the shank towards

the trailing extremity of the shank and preferably extend along the entire length of the thread 20. For most efficient results, the lines of notches extend at approximately 90° to the crest of the helical thread 20.

The configuration and arrangement of the notches 26 is best shown in the enlarged Figures 2 and 4. It will be apparent that three longitudinally extending lines of notches are formed on the thread, thus providing three masonry-removing elements on each convolution of the thread 20. It is important to note also from Figure 4 that the innermost portion of each notch 26 is at a radial distance from the axis of the shank that is in each case not less than the uniform radial distance from that axis to the crest of the protuberance 22.

The radial dimensions from the axis of the shank to the crest of the helical thread 20 are of uniformly decreasing magnitude from near the trailing extremity to near the entering extremity 18, but all thse radial dimensions are greater than the uniform radial distance from the axis of the shank to the crest of the protuberance 22. This is clearly shown in Figure 2.

With reference to Figure 3, the operation of the anchor device 10 will now be described. A masonry-like structure 28 is provided with a cylindrical bore 30 through the use of a conventional masonry-type drilling device. One of the advantages of the present invention is that a workpiece to be attached may be positioned against the structure 28 and provided with an aperture 33 during the drilling operation. When the structure and workpiece have been so prepared, the anchor device 20 is inserted in the bore 30 utilizing a generally conventional rotary fastener driving apparatus.

As the device 10 is rotatably and axially inserted into the bore, the sharp crests of the thread 20 are embedded in the side walls of the bore. The included angle between the flanks of the thread 20 is preferably substantially 30° to facilitate this embedding. Edges of the notches 26 formed in the crests of the thread 20 gradually chip and remove masonry material from the side walls, permitting the thread to be firmly embedded therein. Because of the gradually tapered crest radius of the thread 20, the notches will serve to gradually remove segments of the wall of the bore to accomplish embedding. These notches 26, in conjunction with the tapering of the crest radius, enable the insertion of the device to be accomplished with a minimum of disturbance of the wall structure in the bore. This is important because of the nature of the masonry-type material, which generally tends to crumble and loses its capability to be anchored to. The gradual chipping performed by the notches during the continued rotation of the device serves to ensure the firm embedding of at least the larger, upper, thread portion of the convolutions 20.

Attention is now directed to the helical protuberance 22 which serves as guide menas in the use of the anchor device 10 in a masonry-like environment. The guide means 22 has a substnatially constant crest radius, preferably equal to or slightly larger than the bore radius. This feature serves to guide and accurately centre the device in the bore. Without such guide means, the device could be tilted in the bore as it is driven, due to the presence of aggregate on one side of the bore and not on the other. It should be apparent that a threaded device which is positioned in an inclined manner in a bore will not provide the maximum amount of pull-out resistance, since the crests of its thread will not be uniformly embedded about the periphery of the shank.

The convolutions of the thread 20 and guide means 22 are spaced from one another by portions 24 of shank surface. These portions are at a uniform radius from the axis of the shank. As best shown in Figure 3, these portions 24, and cooperating opposing surfaces of the guide means 22 and thread 20 afford enhancement of the operability of the device. As the dust or aggregate particles are gradually removed from the wall of the bore through the agency of the notches 26, the material removed is trapped in a reservoir 34 formed between adjacent convolutions and utilizing the space around the portions 24. The ability of the dust and aggregate particles to be received in a reservoir, rather than acting on the device to create torsional friction, enables the device to be inserted at relatively low torque levels. The retention of the dust particles in the reservoirs could also enhance the pull-out strength of the anchor.

While the entering extremity 18 may be of any desired configuration, a substnntially pointed tip is preferred, to locate the device approximately in a bore. The point may be configured with features enabling the device to form the bore, such as self-drilling features. In conjunction with this tip, a reaming section 40 may be provided between the point and the first convolutions of the thread and guide means as shown in the modifcation of Figure 5. This reaming section has a maximum transverse dimension substantially equal to the diameter of the helical guide means 22. Such a section 40 will serve to accurately prepare the diameter of the bore to conform generally with the crest radius of the guide means 22. It should be understood that other forms of reaming means could be used other than the longitudinal splines shown herein.

WHAT WE CLAIM IS:

1. An anchor device for insertion and retention in a bore of a predetermined diameter formed in a masonry-type support surface, the device comprising a shank extending from an entering extremity to a trailing extremity, with an enlarged head portion at the trailing extremity, the head portion including rotation inducing surfaces, a helical thread formed on the shank and providing a first plurality of convolutions extending along the shank, helical guide means formed on the shank as a second plurality of convolutions extending along the shank, the crest of the guide means being at a substantially uniform radial distance from the longitudinal axis of the shank, the convolutions of the guide means being positioned between adjacent convolutions of the thread, the radial dimensions from the axis of the shank to the crest of the helical thread being of uniformly decreasing magnitude from near the trailing extremity to near the entering extremity of the shank, but all greater than the said uniform radial distance from the axis of the shank to the crest of the guide means, notches formed in the crest of the helical thread on at least a plurality of the first convolutions adjacent to the entering extremity of the shank, the notches enabling the crest of the helical thread to become firmly embedded in the side wall of the bore as the device is rotated about the longitudinal axis by chipping the side wall of the bore to an increasing depth as the helical thread progresses into the bore, the adjacent first and second convolutions being spaced from each other along the shank, thereby providing a reservoir to receive and retain the masonry material removed from the side wall of the bore due to the embedding of the crest portions of the helical thread therein.

2. The anchor device of claim 1, wherein the notches lie along lines which extend along the length of the shank and are substantially perpendicular to the crest of the helical thread.

3. The anchor device of claim 1, wherein there are a plurality of the notches in each of the said plurality of first convolutions.

4. The anchor device of any of claims 1 to 3, wherein the notches are formed on substantially all of the first convolutions.

5. The anchor device of any of claims 1 to 4, wherein the helical thread has an included angle of substantially 30° between its flanks.

6. The anchor device of any of claims 1 to 5, wherein the innermost portion of each notch is at a radial distance from the said axis of the shank that is in each case not less than the said uniform radial distance from that axis to the crest of the guide means.

7. The anchor device of any of claims 1 to 6. wherein the portions of shank surface between the spaced convolutions are at a uniform radius from the said axis of the shank.

8. The anchor device of any of claims 1 to 7, which includes reaming means on the shank between the entering extremity of the shank and the extremities of the helical thread and helical guide means adjacent the entering extremity of the shank, the reaming means having a maximum transverse dimension substantially equal to the diameter of the helical guide means.

9. The anchor device of claim 1, substantially as described with reference to Figure 1, Figures 2 to 4, or Figure 5 of the accompanying drawings.

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1510686 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

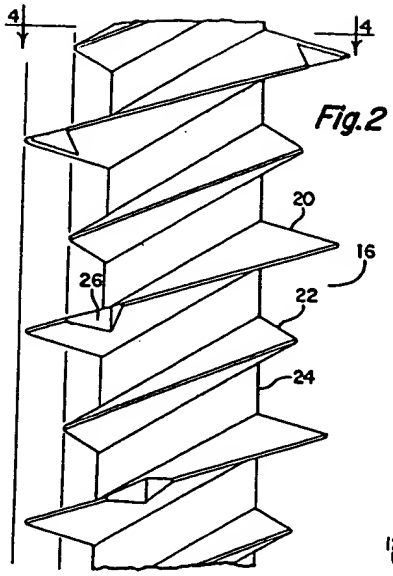

Fig.2

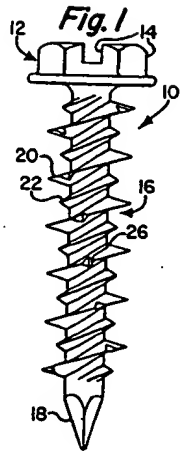

Fig.1

1510686 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

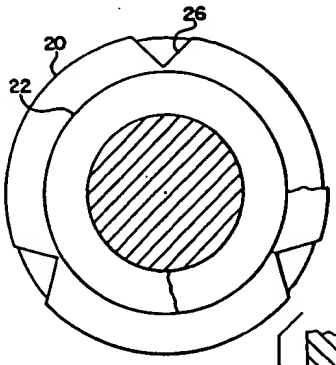

Fig.4

Fig.3

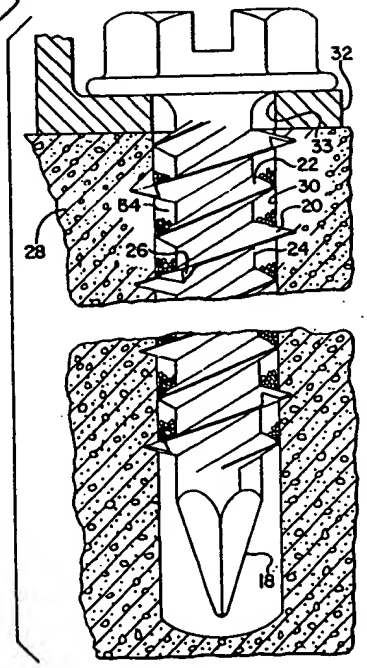

Fig.5